ANCHOR QEA

integral consulting inc.

614 Magnolia Avenue
Ocean Springs, Mississippi 39564
Phone 228.818.9626
Fax 228.818.9631

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MEMORANDUM

To: Gary Miller — **Date:** October 5, 2011
U.S. Environmental Protection Agency

From: Jennifer Sampson, Integral Consulting Inc.
David Keith, Anchor QEA, LLC

Cc: March Smith and Andrew Shafer, McGinnes Industrial Maintenance Corporation
Philip Slowiak, International Paper Company

Re: Addendum 1 to the Tissue Sampling and Analysis Plan (SAP) for additional background catfish and crab tissue sampling, San Jacinto River Waste Pits Superfund Site

INTRODUCTION

This memorandum is an addendum to the Sampling and Analysis Plan (SAP) for the Tissue Study at the San Jacinto River Waste Pits (SJRWP) Superfund site (Site) (Integral 2010), and is submitted on behalf of International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC) (collectively referred to as Respondents), pursuant to the requirements of Unilateral Administrative Order (UAO), Docket No. 06-03-10, which was issued on November 20, 2009 (USEPA 2009). The UAO requires Respondents to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the Site.

This addendum to the Tissue SAP (Integral 2010) was prepared following a discussion of data gaps that were identified in the draft Preliminary Site Characterization Report (PSCR), submitted to the U.S. Environmental Protection Agency (USEPA) on July 20, 2011 (Integral and Anchor QEA 2011). In addition to the text of the PSCR, a summary of the data gaps (which include both tissue and sediment data for background areas) was submitted to USEPA and discussed with USEPA and other oversight agencies in a meeting on August 30, 2011. A summary of the data gaps is included here as Attachment A and provides the data analysis that supports the data quality objectives (DQOs) for additional tissue sampling, which are specified below.

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In addition to addressing the DQOs for additional background tissue sampling, this addendum provides for all quality assurance and quality control (QA/QC) procedures that will be applied during tissue sampling, analysis, data validation, and reporting. As an addendum to the SAP, this document describes a sampling effort to be conducted in full compliance with the approved Tissue SAP (Integral 2010) and related appendices (including the Field Sampling Plan, which is Appendix A to the Tissue SAP). Only those aspects unique to the additional background tissue sampling to be conducted in October of 2011 are addressed by this document.

STATEMENT OF THE PROBLEM

Concentrations of several chemicals of potential concern (COPCs) in hardhead catfish fillet and blue crab edible tissue collected from Cedar Bayou (the background area selected for sampling catfish and blue crab for the SJRWP RI/FS) are significantly lower than they are elsewhere in the region, not including the Site (Attachment A). A specific comparison of dioxin and furan concentrations (as the 2,3,7,8-TCDD toxicity equivalent, or TEQ_{DF}) in crab and catfish from the San Jacinto estuary and upper Galveston Bay with those of Cedar Bayou demonstrates that the TEQ_{DF} concentrations in the Cedar Bayou samples are statistically significantly lower than in these other non-Site areas (Attachment A). The TEQ_{DF} in catfish and crab tissue from areas downstream of Buffalo Bayou in the San Jacinto estuary and upper Galveston Bay may differ from those in Cedar Bayou because there are other, non-Site sources of dioxins and furans potentially influencing catfish and crab tissues in these areas. For example, industrial and municipal wastewater outfalls and urban runoff affecting Buffalo Bayou are a potential source of dioxins and furans to catfish and crab tissue unrelated to the Site (Attachment A). Moreover, analysis presented in the draft PSCR (Integral and Anchor QEA 2011) of the chemical mixtures in sediments on the Site indicates that the mixture of dioxins and furans that characterize the waste in the impoundments north of I-10 contribute significantly to the overall dioxin and furan mass in sediments only in a limited area, very near to the impoundments on the Site. This result suggests a minimal (if any) potential for effects on tissue in areas south of the lower San Jacinto estuary and upper Galveston Bay. Because the catfish and crab captured on the Site may have migrated through lower San Jacinto estuary and upper Galveston Bay before arriving on the Site, some of their tissue

burden may have been derived from non-Site sources. This unknown portion of the tissue contamination cannot be addressed by remediation of the Site.

The problem to be addressed by additional sampling of hardhead catfish fillet and blue crab edible tissue in background areas is a lack of information to characterize the true anthropogenic background condition for these tissues, which includes the effects of sources of dioxins and furans not associated with the waste impoundments north of I-10. The Site-specific background dataset may have several uses in the RI/FS process, including assessment of incremental risks due to the Site, and development of Preliminary Remediation Goals (PRGs). Both of these uses inform the degree to which remediation of the Site will affect risk reduction. If background data does not reflect non-Site sources of COPCs in tissue, the final remedial goals for the site may be unrealistic and unachievable.

ANALYSIS OF EXISTING INFORMATION AND SELECTION OF ANALYTES

Attachment A summarizes the analysis of existing data that supports further efforts to characterize the anthropogenic background condition in edible tissues of hardhead catfish and blue crab.

Dioxin and furan concentrations, percent moisture, and percent lipid will be analyzed in the additional edible tissue samples to be collected in the additional background area. Because dioxins and furans are the indicator chemical group on the Site (Integral 2010), and because they are the most likely risk driver on the Site, they are the most important chemical analytes for this effort.

PROJECT ORGANIZATION, METHODS, AND QUALITY ASSURANCE PROCEDURES

Tissue sampling and analyses described in this addendum will be conducted in full compliance with the Tissue SAP (Integral 2010) and related appendices (including Appendix A, the Field Sampling Plan), in the context of the objectives relevant to this task. The Tissue SAP describes the means to achieve all QA/QC requirements and documentation articulated by USEPA's guidance for preparation of quality assurance project plans and field sampling plans (USEPA 1998, 2001); these specifications will be applied to the collection, analysis, QA review, data management, validation, and reporting of the information generated as described in this addendum. Sampling personnel will comply with the overall Health and

Safety Plan (HSP) (Anchor QEA 2009) and Addendum 1 to the overall HSP that is provided in Appendix A of the Tissue SAP (Integral 2010, Appendix A, Attachment A1).

The tissue analytes, the method reporting limits, and the method detection limits for dioxins and furans are listed in Table 1.

DATA QUALITY OBJECTIVES

This section provides a summary of the DQOs for the proposed background tissue sampling, inclusive of the objective of the task, analytical approach, and sampling locations.

Sampling Objective

The approach to additional collection of edible blue crab tissue and hardhead catfish fillet in background areas was developed in consideration of the following:

- Sources of dioxins and furans to the aquatic environment exist in areas upstream of the Site and downstream of the Fred Hartman Bridge (University of Houston and Parsons, 2006).
- Catfish and crabs are highly mobile, but the specifics of their movements are not well described. Those captured on the Site may have tissue burdens of dioxins and furans not solely attributable to the wastes in the impoundments north of I-10 on the Site, but may have derived from elsewhere in the San Jacinto – Galveston Bay ecosystem.
- Dioxins and furans (as TEQ_{DF}) in the existing Site-specific background data for tissues from Cedar Bayou set are significantly lower than in other samples of the same tissue types from the San Jacinto estuary and upper Galveston Bay (Attachment A). This pattern is true for several COPCs, suggesting that Cedar Bayou does not effectively represent anthropogenic background.

The objective of sampling is to obtain 10 composite samples of edible blue crab tissue and 10 composite samples of hardhead catfish fillets to allow characterization of TEQ_{DF} concentrations in the anthropogenic background environment known to be influenced by non-Site sources of dioxins and furans.

Analytical Approach

The sampling program will be conducted in one background area, and samples will be collected as described by the Tissue SAP and as summarized in Table 2. As for all other tissue samples of these same types collected for the SJRWP RI/FS, composite samples consisting of 3 fish and 3 to 5 male crabs within a fixed size range for each species will be collected. Samples will be analyzed for dioxins and furans, percent moisture, and percent lipid, and all analytical results (Table 1) will be added to the background dataset for tissues and used as described in the DQOs for the Tissue SAP and as appropriate to tasks described in the RI/FS Work Plan. Analysis of the resulting data will include evaluations to identify potential outliers.

Information on sample containers, preservation, and holding time requirements are provided in Table 3.

Sampling Locations, Level of Effort and Field Laboratory

The sampling program will be conducted in one new background area, downstream of the Fred Hartman Bridge (in SJFCA5) (Figure 1). Specific locations for deployment of traps and nets will be determined in the field, but initial efforts will be made to spread sampling equipment evenly across each fish collection area (FCA) being sampled, while avoiding the navigation channel and associated shipping traffic (in SJFCA5). Sampling will not be conducted within Barbours Cut terminal area, a U.S. Coast Guard security zone. Figure 1 shows a general grid to assist the field sampling team in sampling as evenly as possible across the area of SJFCA5; it also shows the location of the navigation channel. The field team will make an effort to deploy traps and nets within each grid cell, recognizing that fish and crabs may only be captured where water depth and habitats are suitable. The geographic coordinates of each trap will be recorded during sampling, and the trap location from which each fish to be included in composites was collected will be recorded for each individual fillet sample. Sampling will be conducted in consultation with a representative of USEPA who will attend the sampling event.

It is anticipated that 30 hardhead catfish (for 10 composite samples with 3 fish fillets per sample; carcasses discarded) and 30 to 50 male blue crabs (for 10 composite samples with the edible tissue from 3 to 5 blue crabs in each composite sample) will be collected in SJFCA5 (Table 2).

Tissue samples will be processed in a field laboratory, as they were during the initial tissue sampling event conducted in October 2010 (Integral 2011). The field laboratory will be used to 1) verify that each organism is the correct species, 2) measure and record fish and crab length and weight, 3) photograph each fish and crab (both sides), 4) confirm that crabs are male specimens, 5) perform dissections for removal of fillet tissue, and 6) package and label samples. The field laboratory will also be used to hold the blue crabs alive in aerated chambers overnight until they can be sacrificed and shipped on the following day.

Timing of Sampling and Reporting

Sampling will be conducted following approval of this SAP Addendum, in the first 10 days of October 2011. If sampling is complete by October 10, 2011, validated analytical results are expected to be available and loaded to the project data base by December 15, 2011.

Sample Collection Matrix

Table 4 provides a checklist of samples for use in the field during sampling. It is analogous to Table A-3 in Appendix A of the Tissue SAP (Integral 2010).

REFERENCES

Anchor QEA, 2009. Health and Safety Plan San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. Anchor QEA, Ocean Springs, MS.

Integral, 2010. Sampling and Analysis Plan: Tissue Study. San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. Integral Consulting Inc., Seattle, WA.

Integral, 2011. Field Sampling Report: Tissue Study. San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. Integral Consulting Inc., Seattle, WA.

Integral and Anchor QEA, 2011. Draft Preliminary Site Characterization Report, San Jacinto River Waste Pits Superfund Site. Prepared for McGinnes Industrial Maintenance Corporation, International Paper Company, and U.S. Environmental Protection Agency, Region 6. Integral Consulting Inc., Seattle, WA.

University of Houston and Parsons, 2006. Total Maximum Daily Loads for Dioxins in the Houston Ship Channel. Contract No. 582-6-70860, Work Order No. 582-6-70860-02. Quarterly Report No. 3. Prepared in cooperation with the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency. . Available at: http://tceq.state.tx.us/assets/public/implementation/water/tmdl/26hscdioxin/26-all-data-compiled-q3-fy06.pdf. University of Houston and Parsons Water & Infrastructure, Austin, TX

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USEPA, 2001. EPA Requirements for Quality Assurance Project Plans. EPA QA/R-5. EPA/240/B-01/003. U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC.

USEPA, 2009. Unilateral Administrative Order for Remedial Investigation/Feasibility Study. U.S. EPA Region 6 CERCLA Docket No. 06-03-10. In the matter of: San Jacinto River Waste Pits Superfund Site Pasadena, Texas. International Paper Company, Inc. & McGinnes Industrial Management Corporation, respondents.

TABLES

Table 1
Analytes, Analytical Concentration Goals, Method Reporting Limits, and Method Detection Limits for Tissue Samples

Analyte	CAS Number	Method Reporting Limit	Method Detection Limit
Conventionals			
Percent moisture (percent)	--	0.01	0.01
Percent lipids (percent)	--	0.1	0.1
Dioxins/furans (ng/kg wet weight)			
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	1	0.0664
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin	40321-76-4	5	0.0656
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin	39227-28-6	5	0.0500
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin	57653-85-7	5	0.0616
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin	19408-74-3	5	0.0525
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin	35822-46-9	5	0.0539
Octachlorodibenzo-*p*-dioxin	3268-87-9	10	0.0990
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin	1746-01-6	1	0.0726
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	5	0.0501
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	5	0.0444
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	5	0.0489
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	5	0.0521
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	5	0.0688
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	5	0.0490
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	5	0.0482
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	5	0.0561
Octachlorodibenzofuran	39001-02-0	10	0.0782
Total tetrachlorinated dioxins	41903-57-5	NA	NA
Total pentachlorinated dioxins	36088-22-9	NA	NA
Total hexachlorinated dioxins	34465-46-8	NA	NA
Total heptachlorinated dioxins	37871-00-4	NA	NA
Total tetrachlorinated furans	30402-14-3	NA	NA
Total pentachlorinated furans	30402-15-4	NA	NA
Total hexachlorinated furans	55684-94-1	NA	NA
Total heptachlorinated furans	38998-75-3	NA	NA

Notes

-- = none

CAS = Chemical Abstract Service

NA = not applicable

Table 2
Summary of Target Species, Sample Sizes, and Collection Methods for Tissue Samples

Common Name	Scientific Name	Fish Collection Area (FCA)	Sample Size within Each FCA[a]	Target Length	Tissue Type	Composite or Individual?	Possible Collection Methods
Hardhead Catfish	*Arius felis*	SJFCA5	10	300 to 450 mm[b]	Fillet, skin off	Composite (minimum of 3 fillets per sample); 30 fish to be collected in the FCA	Crab traps; otter trawl; beam trawl, gill net
Blue Crab	*Callinectes sapidus*	SJFCA5	10	125 to 200 mm[c]	All edible tissue	Composite (minimum of 3, but target of 5 crabs per sample); males only[d]; 30 - 50 crabs to be collected in the FCA	Crab traps; otter trawl; beam trawl, gill net

Notes
FCA = fish collection area

a - It is anticipated that 30 hardhead catfish (10 composite samples with 3 fish fillets per samples) and 30 to 50 male blue crabs (with the edible tissue from 3 to 5 blue crabs in each composite sample) will be collected at SJFCA5. A total of 10 hardhead catfish and 10 male blue crab composite samples will be collected during this study.
b - The target length provided in this table is an estimate and will be modified during the sampling event, depending upon the actual fish size class encountered in the field. The smallest fish in a composite will be at least 75 percent of the total length of the largest fish.
c - The target length provided in this table is an estimate and will be modified during the sampling event, depending upon the actual crab size class encountered in the field. The smallest crab in a composite will be at least 75 percent of the total length of the largest crab.
d - If both sexes need to be collected to attain target tissue mass, then each sample will be packaged separately (i.e., will not composite across sexes). No soft shell or sponge crabs (i.e. females with eggs) will be collected.

Table 3
Sample Containers, Preservation, and Holding Time Requirements

Parameter	Container [a,b]		Laboratory	Preservation[c]	Holding Time	Sample Size[d]
	Type	Size				
Tissue						
Dioxins/furans and lipids	WMG	4 oz.	CAS-Houston	Deep frozen (-20°C)	1 year	10 g
Equipment Filter Wipe Blanks (generated in the field and by the laboratory) [e]						
Dioxins/furans		4 oz.	CAS-Houston	4±2°C	1 year/1 year [f]	1 wipe
Tissue Homogenization Rinsate Blanks (generated by the laboratory)						
Dioxins/furans	AG	500 mL	CAS-Houston	4±2°C	1 year	500 mL

Notes

AG - amber glass
CAS = Columbia Analytical Services
WMG = wide mouth glass

a - The containers listed for tissues reflect the jars necessary for storage of homogenized tissue samples at the testing laboratory. Prior to homogenization (i.e., in the field), fish and crab samples will be wrapped in foil and double-bagged in resealable plastic bags. All tissues will be processed at CAS Kelso, and aliquots of the tissue homogenate will be sent frozen to CAS Houston for dioxin/furan analyses.
b - The size and number of containers may be modified by the analytical laboratory.
c - Whole crab samples will not be frozen in the field, but will be shipped to CAS - Kelso laboratory on ice at 4 ± 2 °C. Freezing can rupture internal organs, confounding analyses of individual tissus.
d - Total sample mass requirement is 10 g. A minimum of 30 g is targeted for all tissues due to possible mass loss during homogenization.
e - Whatman filter papers will be used for organic blanks (Whatman filter paper will be provided by CAS - Kelso).
f - Holding time for samples prior to extraction/holding time for extracts.

Table 4
Field Sample Collection Matrix

Tissue Sampling Location	Sample ID	Tissue Type [e]	Sample Number	Tag Number	Target Species	Composite Sample Type	Minimum No. in Composite [c]	Minimum Target Tissue Mass Required [c]	Sample Group	Tissue Samples	Blank Filter Wipes [a]
										PCDD/F, percent moisture, and lipids	PCDD/F
										Field: Fish and crabs will be foil wrapped and double bagged; Lab: 4 oz. WMG for homogenate [b]	4 oz. WMG [c]
										4±2°C in field/frozen (-20°C) after field processing, during shipment, and for laboratory storage and laboratory transfer [b]	4±2°C
☐ SJFCA5	SJFCA5-LF1	Large Fish (300-450 mm) [d]	TS0161	TG0200	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF2	Large Fish (300-450 mm) [d]	TS0162	TG0201	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF3	Large Fish (300-450 mm) [d]	TS0163	TG0202	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF4	Large Fish (300-450 mm) [d]	TS0164	TG0203	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF5	Large Fish (300-450 mm) [d]	TS0165	TG0204	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF1	Large Fish (300-450 mm) [d]	TS0166	TG0205	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF2	Large Fish (300-450 mm) [d]	TS0167	TG0206	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF3	Large Fish (300-450 mm) [d]	TS0168	TG0207	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF4	Large Fish (300-450 mm) [d]	TS0169	TG0208	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	
☐ SJFCA5	SJFCA5-LF5	Large Fish (300-450 mm) [d]	TS0170	TG0209	Hardhead Catfish	Fillet	3 Fillets [e]	30 g	Downstream Background	☐	

Table 4
Field Sample Collection Matrix

Tissue Sampling Location	Sample ID	Tissue Type [e]	Sample Number	Tag Number	Target Species	Composite Sample Type	Minimum No. in Composite [c]	Minimum Target Tissue Mass Required [c]	Sample Group	Tissue Samples	Blank Filter Wipes [a]
										PCDD/F, percent moisture, and lipids	PCDD/F
										Field: Fish and crabs will be foil wrapped and double bagged; Lab: 4 oz. WMG for homogenate [b]	4 oz. WMG [c]
										4±2°C in field/frozen (-20°C) after field processing, during shipment, and for laboratory storage and laboratory transfer [b]	4±2°C
☐ FW Blank	SJFW-910	NA	FW0010	TG0210	NA	Equipment Filter Wipe	NA	NA	NA		☐
☐ Filter Blank	SJFB-911	NA	FB0011	TG0211	NA	Filter Blank	NA	NA	NA		☐
☐ SJFCA5	SJFCA5-BC1	Crab (125-200 mm) [f]	TS0171	TG0212	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC2	Crab (125-200 mm) [f]	TS0172	TG0213	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC3	Crab (125-200 mm) [f]	TS0173	TG0214	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC4	Crab (125-200 mm) [f]	TS0174	TG0215	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC5	Crab (125-200 mm) [f]	TS0175	TG0216	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC1	Crab (125-200 mm) [f]	TS0176	TG0217	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC2	Crab (125-200 mm) [f]	TS0177	TG0218	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC3	Crab (125-200 mm) [f]	TS0178	TG0219	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	

Table 4
Field Sample Collection Matrix

Tissue Sampling Location	Sample ID	Tissue Type [e]	Sample Number	Tag Number	Target Species	Composite Sample Type	Minimum No. in Composite [c]	Minimum Target Tissue Mass Required [c]	Sample Group	Tissue Samples	Blank Filter Wipes [a]
										PCDD/F, percent moisture, and lipids	PCDD/F
										Field: Fish and crabs will be foil wrapped and double bagged; Lab: 4 oz. WMG for homogenate [b]	4 oz. WMG [c]
										4±2°C in field/frozen (-20°C) after field processing, during shipment, and for laboratory storage and laboratory transfer [b]	4±2°C
☐ SJFCA5	SJFCA5-BC4	Crab (125-200 mm) [f]	TS0179	TG0220	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	
☐ SJFCA5	SJFCA5-BC5	Crab (125-200 mm) [f]	TS0180	TG0221	Blue Crab	All edible tissue (send to CAS in shell)	3 Crabs minimum; target 5 Crabs if possible; males only [g]	30 g (confirm weight with sacrificial field measurement [if needed]) + 20%	Downstream Background	☐	

Notes

NA = not applicable

PCDD/F = polychlorinated dibenzo-*p*-dioxin and polychlorinated dibenzofuran

WMG = wide mouth glass

It is anticipated that 30 hardhead catfish (10 composite samples with 3 fish fillets per samples) and 30-50 male blue crabs (with the edible tissue from 3 to 5 blue crabs in each composite sample) will be collected at SJFCA5. A total of 10 hardhead catfish and 10 male blue crab composite samples will be collected during this study.

a - Whatman filter papers will be used for organic blanks.

b - The size and number of containers may be modified by the analytical laboratory. Whole crab samples will not be frozed prior to shipping.

c - Triple the amount of target tissue mass will be required for two samples in each tissue type for laboratory quality control samples and for preparation of the tissue homogenization blank (i.e., 180 g).

d - The target length provided in this table is an estimate and will be modified during the sampling event, depending upon the actual fish size class encountered in the field. The smallest fish in a composite will be at least 75 percent of the total length of the largest fish.

e - More than three fish may be included in a sample if additional fish are necessary to attain the target tissue mass. If the target tissue mass cannot be obtained with a single species sample (i.e., either the target species or alternative species), then a market basket approach will be used with multiple species (of the same target length) being included in the sample.

f - The target length provided in this table is an estimate and will be modified during the sampling event depending upon the actual crab size class encountered in the field. The smallest crab in a composite will be at least 75 percent of the total length of the largest crab.

g - If both sexes need to be collected to attain target tissue mass, each sample will be packaged separately (i.e., will not composite across sexes). No soft shell or sponge crabs (i.e. female crabs with eggs) will be collected.

FIGURES

ANCHOR QEA integral consulting inc.

0 5,000
Feet

- SJFCA5
- Sampling Grid
- Houston Ship Channel (ACOE 2010)
- USEPA's Preliminary Site Perimeter

Figure 1
Additional Background Fish Collection Area for
Hardhead Catfish and Blue Crab
Tissue SAP Addendum 1
SJRWP Superfund/MIMC and IPC

ATTACHMENT A
SUMMARY OF RI/FS DATA GAPS AND SAMPLING PROPOSAL OUTLINE, SJRWP

ANCHOR QEA

integral consulting inc.

614 Magnolia Avenue
Ocean Springs, Mississippi 39564
Phone 228.818.9626
Fax 228.818.9631

MEMORANDUM

To: Gary Miller — **Date:** September 7, 2011
U.S. Environmental Protection Agency

From: Jennifer Sampson, Integral Consulting Inc.
David Keith, Anchor QEA, LLC

Cc: March Smith and Andrew Shafer, McGinnes Industrial Maintenance Corporation
Philip Slowiak, International Paper Company

Re: Summary of RI/FS Data Gaps and Sampling Proposal Outline, San Jacinto River Waste Pits Superfund Site

INTRODUCTION

This memorandum presents a summary of the data gaps for the San Jacinto River Waste Pits (SJRWP) Remedial Investigation/Feasibility Study (RI/FS) that were identified in the draft Preliminary Site Characterization Report (PSCR) (Integral and Anchor QEA 2011), submitted to USEPA on July 20, 2011. This submittal contains greater detail in support of additional sampling, and provides conceptual outlines of sampling approaches that would address the data gaps. All new data would be added to the existing data set, and none of the existing data would be discarded or replaced. This memorandum is being submitted during USEPA review of the draft PSCR because it will be necessary to resolve the issue of data gaps and develop an approved, consensus sampling approach by the end of September 2011 so that sampling can occur in October 2011. This schedule is necessary both to meet USEPA's schedule for the RI/FS, and to obtain samples that are comparable to samples collected during the original RI/FS sampling programs.

The RI/FS is being conducted at the SJRWP Superfund site (the Site) pursuant to the requirements of Unilateral Administrative Order, Docket No. 06-03-10 (USEPA 2009). This memorandum is submitted on behalf of International Paper Company and McGinnes Industrial Maintenance Corporation (collectively referred to as Respondents).

SUMMARY OF DATA GAPS

The draft PSCR concludes that the Site-specific background datasets for tissue and sediment are incomplete, and provides supporting rationale. The related text of the PSCR is excerpted below for tissue and sediment. Additional details are also presented below for both tissue and sediment that support the finding of the PSCR that these background data sets are incomplete.

The objective of additional sampling described in this memorandum is to accurately characterize the background condition. The Site-specific background dataset may have several uses in the RI/FS process, including the following:

- Comparison of Site-related and background risks, so that the incremental risk due to the Site can be accurately characterized
- Development of Preliminary Remediation Goals (PRGs), for which background concentrations in sediment, and even in tissue, may be a central consideration.

Both of these uses are fundamentally related to the same question: How much risk can be addressed by remediation at the Site? If the existing background dataset is insufficient to accurately characterize the actual background risk, or if background data is used to support development of a PRG that does not account for the other sources of chemicals of potential concern (COPCs), the final remedial goals for the site may be unrealistic and unachievable. To develop a successful remedial program, it is necessary to have an accurate representation of the background condition for both tissue and sediments.

Tissue Data Gaps

Toxicity equivalent concentrations of dioxins and furans (TEQ_{DF}) in catfish fillet and blue crab tissue collected from Cedar Bayou for the RI/FS are noticeably lower than concentrations in edible tissue of these species from any other study for the lower San Jacinto River and Upper Galveston Bay in the RI/FS database. Section 6.2.2 of the draft PSCR reports on data from these other studies as follows:

> "The 151 samples of blue crab edible tissue collected by these studies had a range of TEQ_{DF} of 0.05 to 15.8 ng/kg, with a mean of 3.11 ng/kg and a 95th percentile at 8.86 ng/kg. These values are substantially greater than the

0.14 ng/kg TEQ_{DF} [reference envelope value, or REV] calculated for crab edible tissue collected from Cedar Bayou as part of the RI (Table 6-50). In fact, the maximum TEQ_{DF} for the crab samples from Cedar Bayou (0.113 ng/kg) was lower than the 10th percentile of these historical data collected by TCEQ and TDSHS throughout the San Jacinto and Galveston Bay system. The data for all other COPCs were also higher in the historical state datasets (where data for other COPCs were available) compared to crabs collected from Cedar Bayou; exceptions were aluminum, arsenic, and manganese, for which concentrations ranges were comparable between Cedar Bayou and the other offsite data, and magnesium and mercury, which had a larger range in Cedar Bayou compared to the historical offsite data.

Similar patterns were also observed for hardhead catfish fillet, with 81 measurements of TEQ_{DF} for samples collected from outside the preliminary Site perimeter, both upstream and downstream of the Site. These samples have a range of TEQ_{DF} between 0.40 and 16.0 ng/kg, with a mean of 5.7 and 95th percentile of 12.3 ng/kg, respectively. The maximum TEQ_{DF} concentration (0.389 ng/kg) for catfish samples from Cedar Bayou areas collected in the RI dataset (Table 6-52) is below the minimum value observed throughout the San Jacinto and Galveston Bay ecosystem in the historical data collected by state agencies."

To provide a more detailed perspective on these differences, tissue concentrations of dioxins, furans, and polychlorinated biphenyls (PCBs) in tissue samples from Cedar Bayou and from the reach of the San Jacinto River downstream of the confluence with Buffalo Bayou to Morgan's Point (Area SJFCA5, Figure 1) were further evaluated for this data gaps memorandum. Specifically, data collected from SJFCA5 by the Texas Commission on Environmental Quality (TCEQ) for the Total Maximum Daily Load (TMDL) program, and the Texas Department of State Health Services (TDSHS) data from 2002 and onward, were evaluated relative to the RI/FS data for Cedar Bayou. TCEQ and TDSHS sampling locations within SJFCA5, an alternative background sampling area considered in the Tissue Sampling and Analysis Plan (SAP) (Integral 2010), are shown in Figure 1.

The area in SJFCA5 was proposed as a background sampling area in the Tissue SAP to include in the characterization of background conditions the important influence of non-Site sources of COPCs on exposures of aquatic species that may range widely beyond the Site, even if they are captured on the Site. Because little is known about the specific movements and home ranges of blue crabs and hardhead catfish captured at the Site, it is uncertain what the concentrations of COPCs in edible tissues would be if the Site did not exist. Although this characterization is never completely attainable, sampling edible tissue of highly mobile species from areas known to be influenced by a wide range of urban COPC sources provides a valuable perspective on that uncertainty.

Simple comparisons of data from Cedar Bayou with data from SJFCA5 using the 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (TCDD) toxicity equivalent (TEQ) calculated with dioxins and furans only (TEQ_{DF}) or with dioxin-like PCBs only (TEQ_P) are presented in the attached Figures 2 through 5. These illustrations show data for individual samples and aggregate statistics for TEQ_{DF} and TEQ_P in edible blue crab (Figures 2 and 3, respectively) and TEQ_{DF} and TEQ_P for hardhead catfish fillet (Figures 4 and 5, respectively). These figures clearly illustrate that the concentrations of TEQ_{DF} and TEQ_P in these two tissue types from Cedar Bayou are not representative of those in the general area. In all cases, the TEQ_{DF} or TEQ_P concentration in tissue from Cedar Bayou is statistically significantly lower than the concentrations in the corresponding tissue from SJFCA5 (Mann-Whitney-Wilcoxon, $p < 0.05$), consistent with the analysis presented in the draft PSCR, and excerpted above.

Although USEPA and its partner agencies may have expressed some concerns during discussion of the Tissue SAP that tissue in SJFCA5 is affected by the Site, the unmixing analysis presented in the draft PSCR indicates that dioxin and furan contamination of sediments that can be attributed to the paper mill wastes in the impoundments north of I-10 is localized to the Site. The unmixing results strongly suggest that a significant influence of the paper mill wastes on sediment and biological tissue several miles away is highly unlikely. The unmixing results support the use of SJFCA5, at least in part, as a source of data to characterize the regional background condition.

Based on the analysis presented in the PSCR and above, it is evident that the blue crab and hardhead catfish data from Cedar Bayou present a picture of background that does not reflect

the influence of important, non-Site-related regional sources of dioxins, furans, and PCBs on tissues elsewhere in the San Jacinto River and Galveston Bay system. Therefore, relying only on the Cedar Bayou tissue data for the Site-specific background in the SJRWP RI/FS will underrepresent the extent to which several receptors can be exposed to COPCs that are not attributable to the Site. This type of error could lead to development of unrealistic and unattainable remediation goals for the Site.

Sediment Data Gaps

The upstream sediment dataset collected to represent Site-specific background does not reflect the full range of percent fines and percent carbon, two physicochemical parameters in sediments that tend to correlate positively with chemical concentrations (Section 6.2.1, draft PSCR). The draft PSCR describes this problem as follows:

> "In the RI sediment dataset, there is a statistically significant correlation[1] between percent fines (as clay plus silt) and TEQ_{DF} (Figure 6-18). Although only 39 percent of the variability of the TEQ_{DF} concentrations is explained by sediment fines, the relationship is both statistically significant and positive. Importantly, Figure 6-18 shows that about half of the range of percent fines in the sediment dataset is not reflected in the background data. Sediments with fines at greater than 50 percent are absent from the background dataset.
>
> To determine whether this was just a reflection of the particle sizes within the impoundments north of I-10, box-whisker plots of grain size in sediments collected from 1) within the impoundments, 2) on the Site but outside of the 1966 impoundment perimeter, and 3) in the upstream background area were generated (Figure 6-19). The organic carbon content of these three compartments was also compared using box plots (Figure 6-19) ... Figure 6-19 strongly suggests that ranges of percent fines and organic carbon content in Site sediments are not fully represented by the upstream background dataset. The maxima and the medians of both the percent organic carbon and the

[1] Correlation of fine sediment (clay and silt) vs. TEQ_{DF}: R^2=0.39, $p < 0.05$

percent fines are lower in the upstream (background) sediment dataset than in the sediments that are on the Site but not within the impoundments."

Figures 6-18 and 6-19 from the draft PSCR are included here as Figures 6 and 7, respectively, to illustrate these differences. In addition, statistical comparisons indicate that both the total organic content and the percent fines of the upstream sediment dataset are statistically significantly lower than in the sediments collected from within the preliminary Site perimeter and from within the northern impoundments themselves (Mann-Whitney-Wilcoxon, $p < 0.05$). This discussion in the draft PSCR concludes that "it appears that the upstream background sediment dataset, in terms of the objective physical characteristics that tend to correlate with the concentrations of organic compounds, are not representative of conditions on the Site. The existing upstream sediment dataset may therefore underestimate the concentrations of dioxins and furans in background sediments."

As for the background tissue dataset, the upstream sediment dataset misrepresents the actual background condition. In the event that the existing Site-specific background sediment data provide a focal point for remedial goals, there is a substantial risk that these goals will be unrealistic and unattainable.

OUTLINE OF PROPOSED SAMPLING

A relatively limited sampling program can be conducted to resolve these two data gaps. This program would consist of collection of edible blue crab and catfish fillet samples from both upstream of the Site and at the southern extent of SJFCA5, and additional sediment sampling within the upstream background area. A few details are provided below for the proposed tissue and sediment sampling; we anticipate that additional specifics will be addressed collaboratively with USEPA before any sampling begins. Please also note that we are not proposing that any of the existing Site-specific background data be removed or replaced. Additional sediment and tissue data would be used to augment the existing data sets.

Tissue Sampling

A general outline of the proposed additional background tissue sampling is as follows:

- Schedule: Early October 2011. This is necessary to make the data compatible with the existing dataset, so that it will be appropriate to aggregate the new data with the existing data.
- Location: The upstream background area, and the southern end of SJFCA5, to the south of the Fred Hartman Bridge. The area to be sampled upstream is the same area within which sediment samples have already been collected for the RI. The area within SJFCA5 was originally under consideration for background tissue sampling, as described in the Tissue SAP. Tissue collected from this area will also better reflect COPC sources other than the Site in the tissues of mobile species within the San Jacinto River and Galveston Bay system. It is therefore a logical place to consider additional sampling. The specific sampling area within SJFCA5 will be limited to waters downstream, or south, of the Fred Hartman Bridge but still within SJFCA5.
- Tissues: Edible crab and catfish fillet. Ingestion of fish and crabs captured on the Site is a likely driver of risk to people. The background condition for these two tissue types is the most important data gap that needs to be addressed to effectively characterize incremental risks due to the Site. Ten samples of each tissue type consisting of composites from at least three individuals will be collected. Up to one-half of these will be taken from the area upstream of the Site, and the other half from the designated area within SJFCA5. Because the spatial distribution of catfish is somewhat dependent upon salinity, and the area upstream of the Site can contain substantial amounts of freshwater, catfish will be sampled for 3 days, or until 15 hardhead catfish (for 5 composites) of the appropriate size can be captured, whichever is less.
- Analytes: Dioxins and furans, percent lipid. The TMDL program has generated dioxin and furan tissue data for these tissues, but the most recent of these data were collected in 2004, and may therefore not represent current conditions. Whether the data for PCBs in tissue, which have been generated more recently (2008–2009), can be upgraded to Category 1 is under evaluation, but it is currently anticipated that no additional data for PCBs will be necessary.

Sediment Sampling

A general outline of the proposed sampling for additional sediment data is as follows:

- Schedule: Concurrent with or immediately following the tissue sampling.
- Location: In the approved upstream background area.
- Analytes: Dioxins and furans, grain size distribution and organic carbon content.
- Approach: The sampling program would specifically target sediments with a grain size distribution characterized by fines (clay plus silt) between 50 and 80 percent. Samples would be collected from 20 locations, selected in consultation with USEPA during the field sampling. Sampling locations would be targeted to meet the goal of obtaining sediment with the appropriate grain size distribution, and a field screen using a wet sieve may be employed to help select the appropriate sediments to submit for analysis. All samples submitted to the lab will be analyzed for percent fines. From those that have 50 to 80 percent fines, a subset of 10 will be selected for analysis of dioxins and furans. The results would be added to the background dataset for sediments.

CONCLUSION

Based on the evaluation of RI/FS data gaps for the SJRWP Site presented in the PSCR, and the additional analysis presented in this memorandum, concentrations of COPCs in catfish and crab tissue reported for Cedar Bayou are lower than for other areas of the San Jacinto River and Galveston Bay system that have not been influenced by releases from the Site. This is particularly evident for dioxins and furans. In addition, the upstream sediment dataset collected for the RI/FS does not reflect the full range of grain size distribution and organic carbon content present in sediments that are on the Site but outside of the 1966 impoundment perimeter. As a result, the range of background dioxin and furan concentrations that is relevant for comparisons with the Site may not be fully reflected in the available tissue and sediment background datasets. These differences represent important data gaps for the RI/FS, because background conditions may become an important consideration in risk management and remedial action decision-making for the Site. Implementation of a supplemental tissue and sediment sampling program as outlined above will address these data gaps in conformance with the requirements of the Unilateral Administrative Order for the RI/FS at the Site.

REFERENCES

USEPA, 2009. Unilateral Administrative Order for Remedial Investigation/Feasibility Study. U.S. EPA Region 6 CERCLA Docket No. 06-03-10. In the matter of: San Jacinto River Waste Pits Superfund Site Pasadena, Texas. International Paper Company, Inc. & McGinnes Industrial Management Corporation, respondents.

FIGURES

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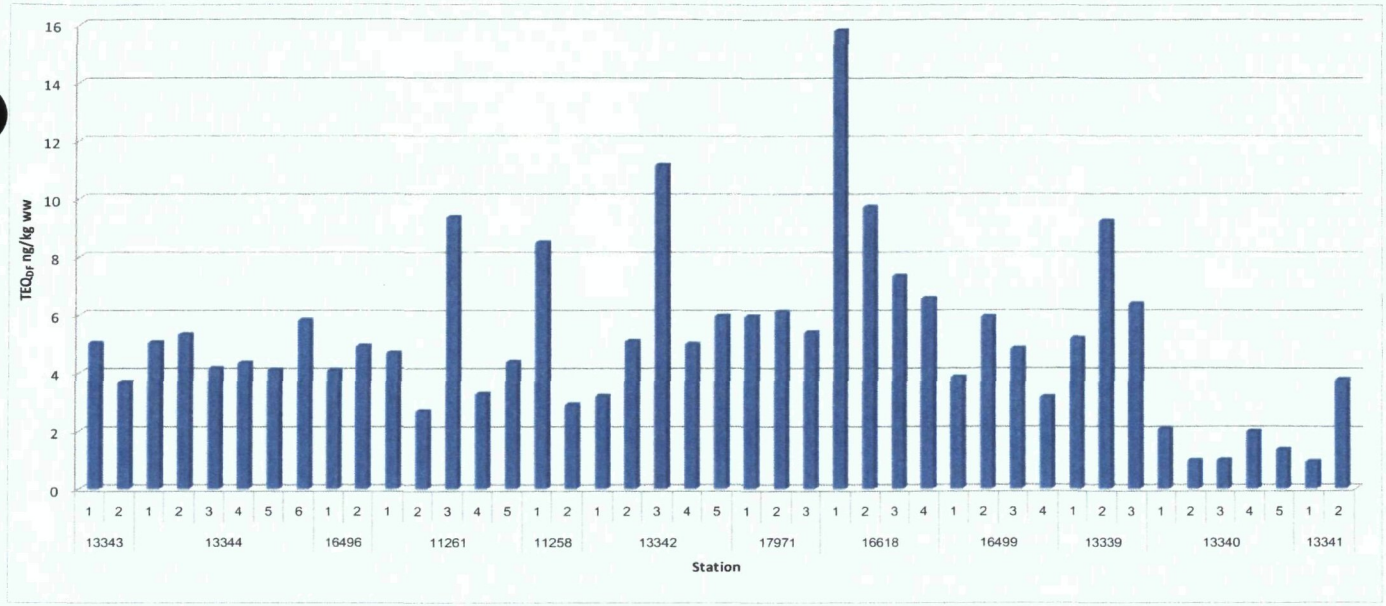
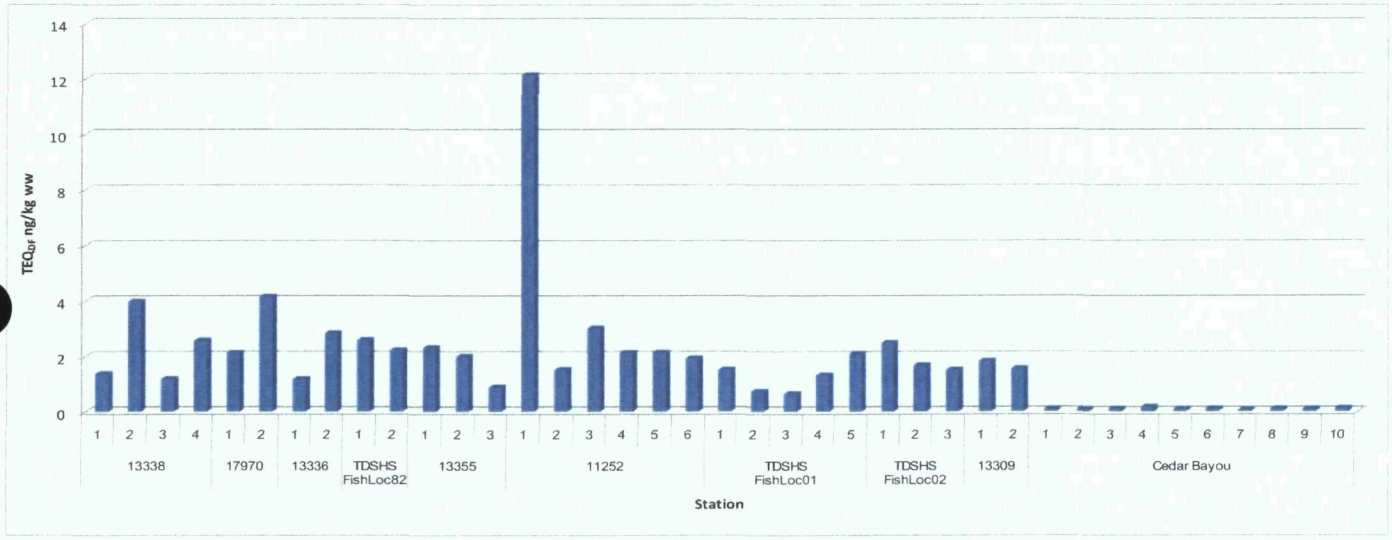
TDSHS Sample Stations
- Analyzed for Dioxins and Furans

TCEQ Sample Stations
- Analyzed for Dioxins and Furans and PCBs
- SJFCA5
- Cedar Bayou
- Preliminary Site Perimeter

Figure 1
Sampling Locations for Catfish and Blue Crab Analyzed for Dioxins, Furans, and PCBs by TCEQ and TDSHS
Data Gaps Memorandum
SJRWP Superfund/MIMC and IPC





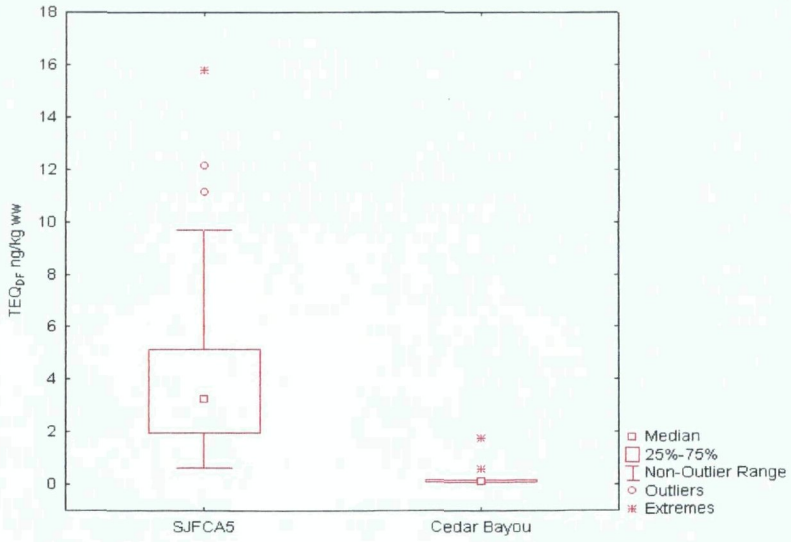


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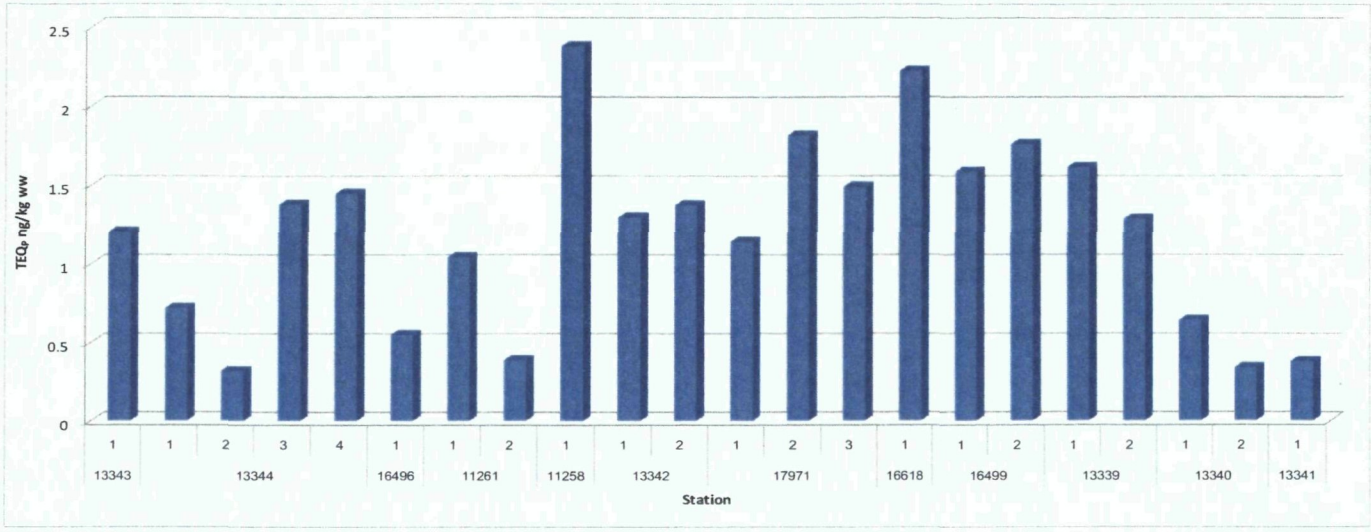
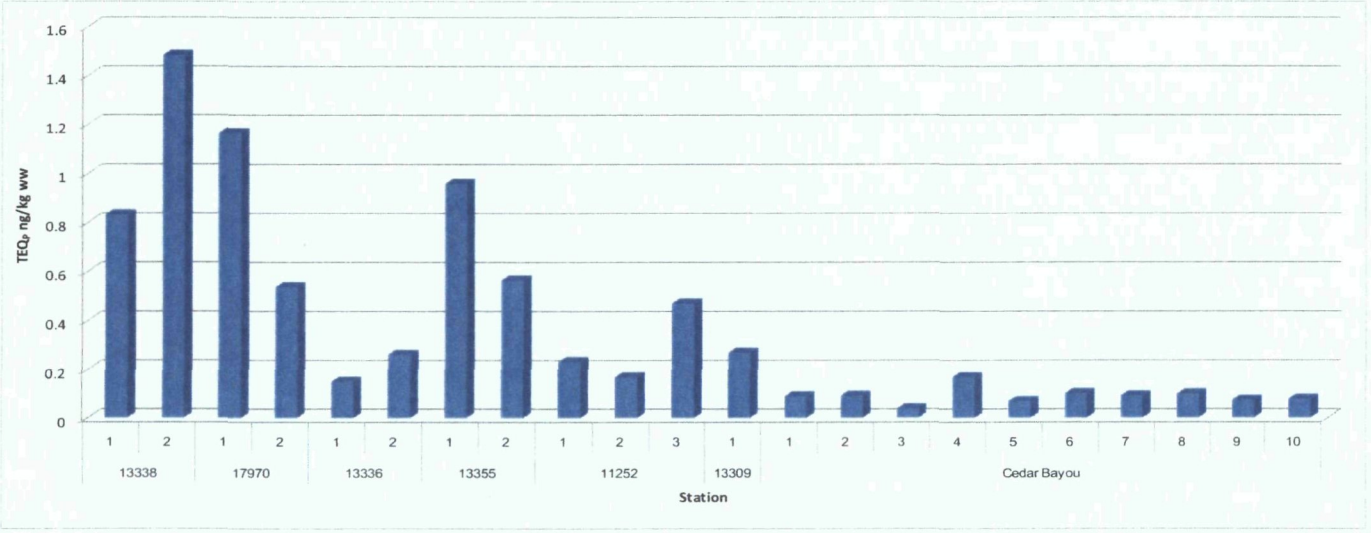
Figure 2
TEQ_{DF} Concentration in Edible Blue Crab Tissue from SJFCA5 and Cedar Bayou
Data Gaps Memorandum
SJRWP Superfund/MIMC and IPC





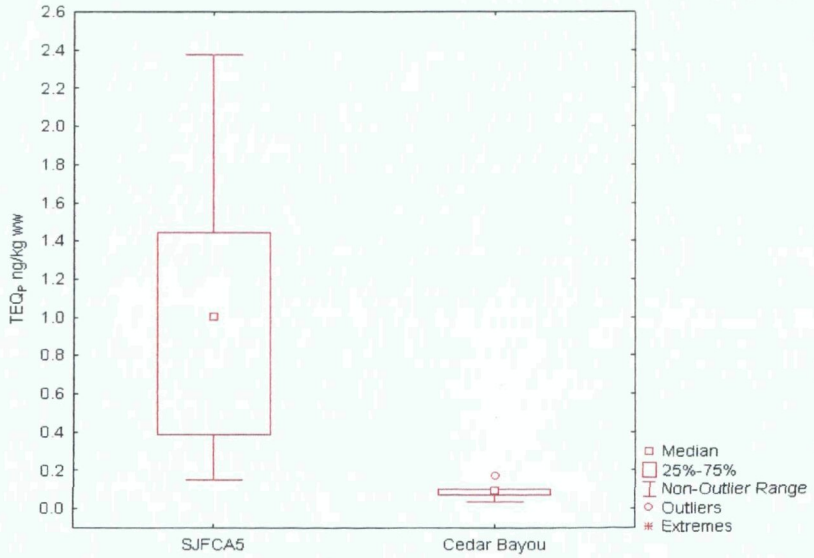
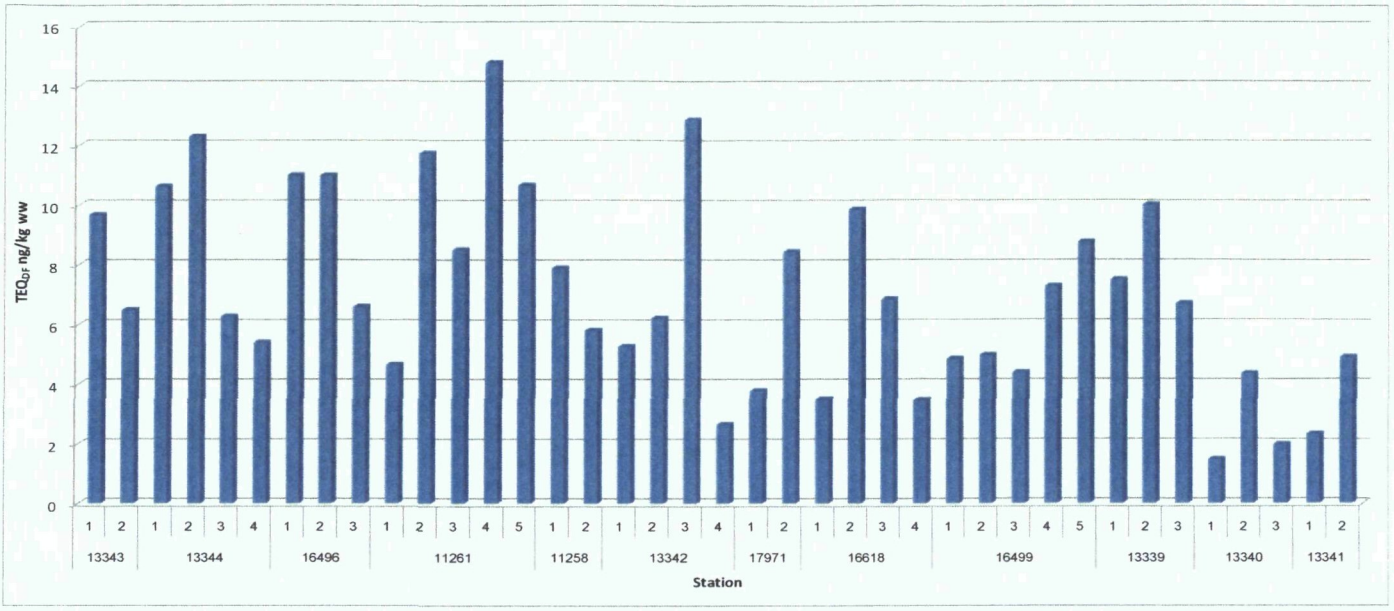
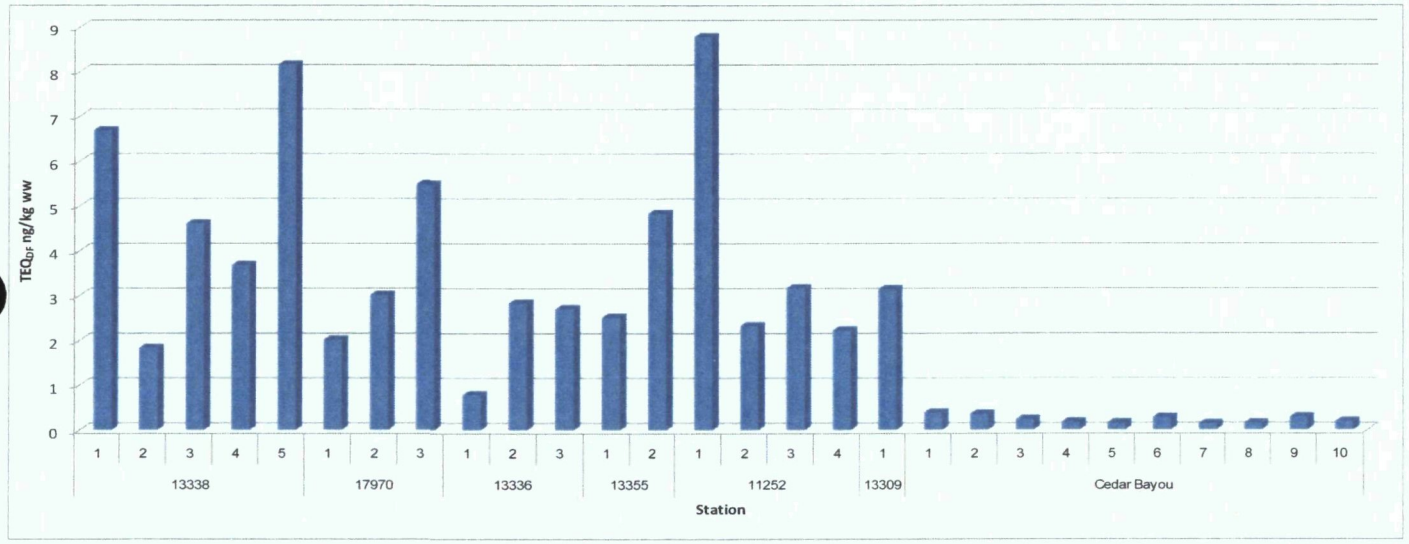


Figure 3
TEQ_P Concentration in Edible Blue Crab Tissue from SJFCA5 and Cedar Bayou
Data Gaps Memorandum
SJRWP Superfund/MIMC and IPC





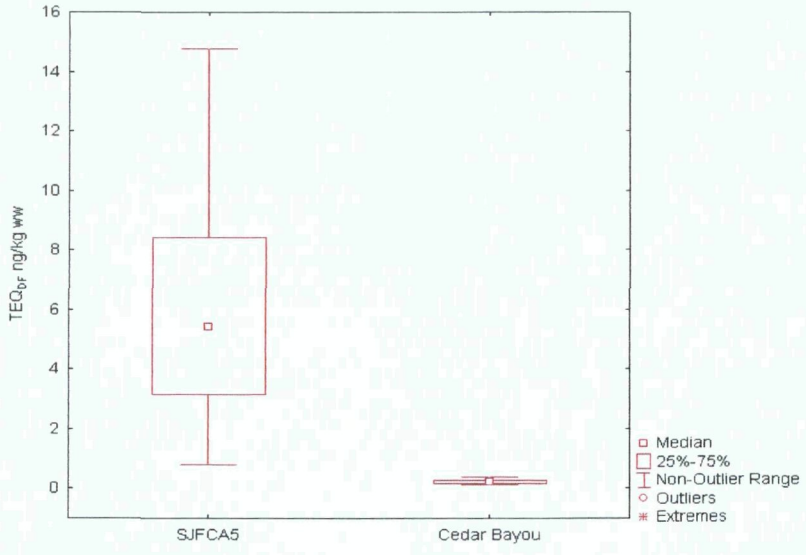
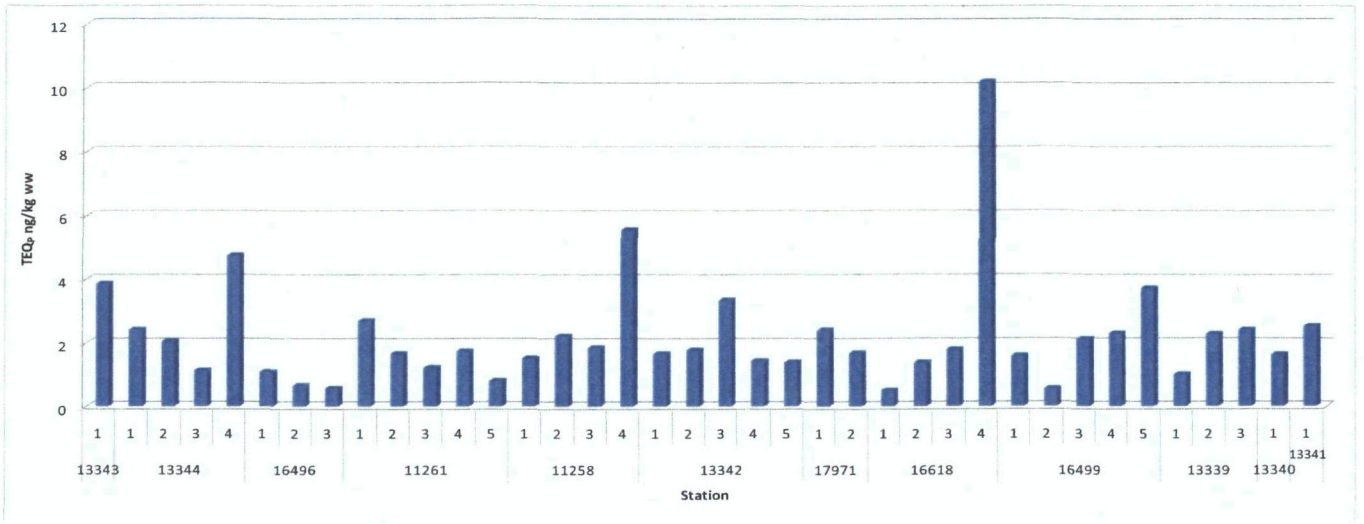
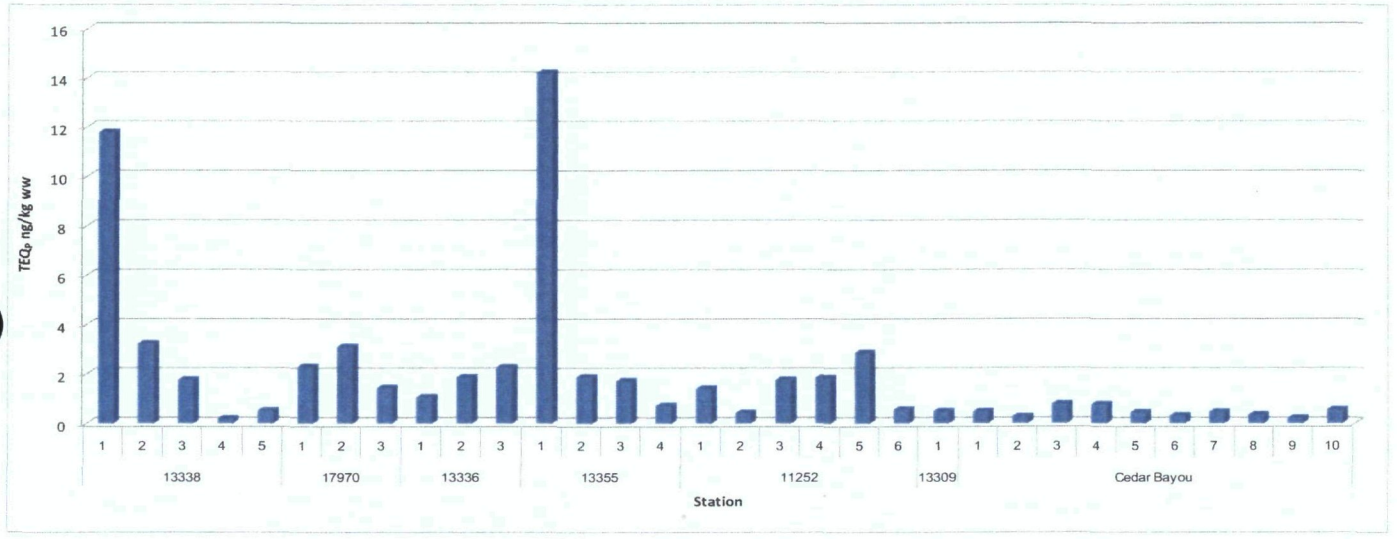


Figure 4
TEQ_{DF} Concentration in Hardhead Catfish Fillet from SJFCA5 and Cedar Bayou
Data Gaps Memorandum
SJRWP Superfund/MIMC and IPC





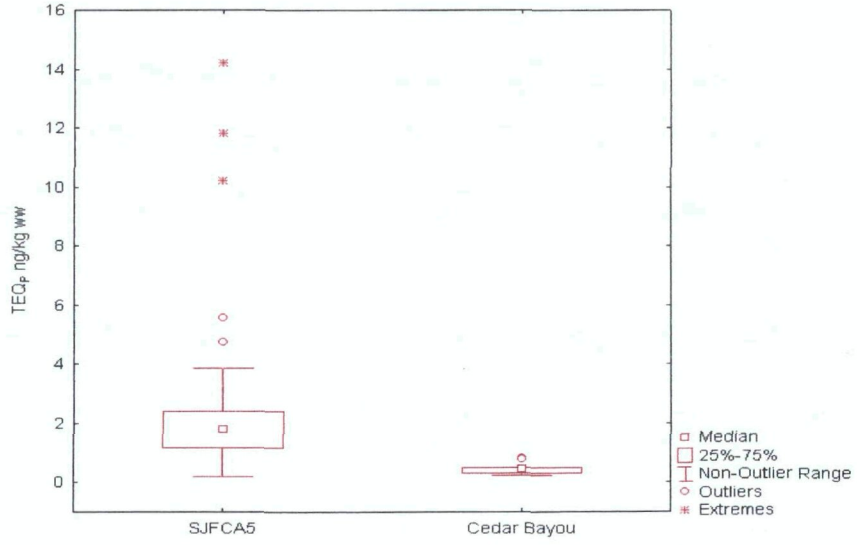


Figure 5
TEQ_p Concentration in Hardhead Catfish Fillet from SJFCA5 and Cedar Bayou
Data Gaps Memorandum
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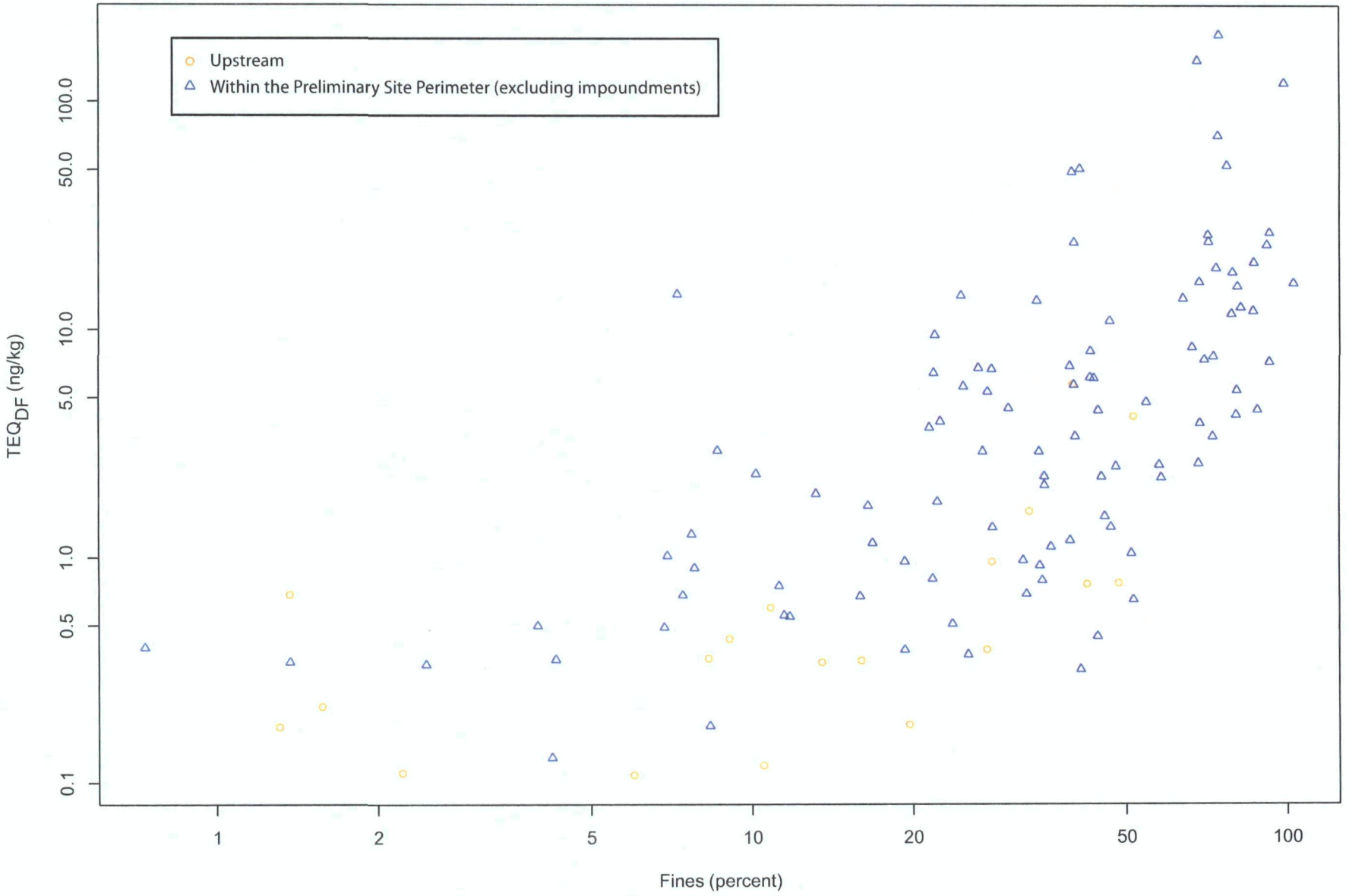

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Figure 6
Relationship Between Fines (Clay + Silt) and TEQ_{DF} in Surface Sediment
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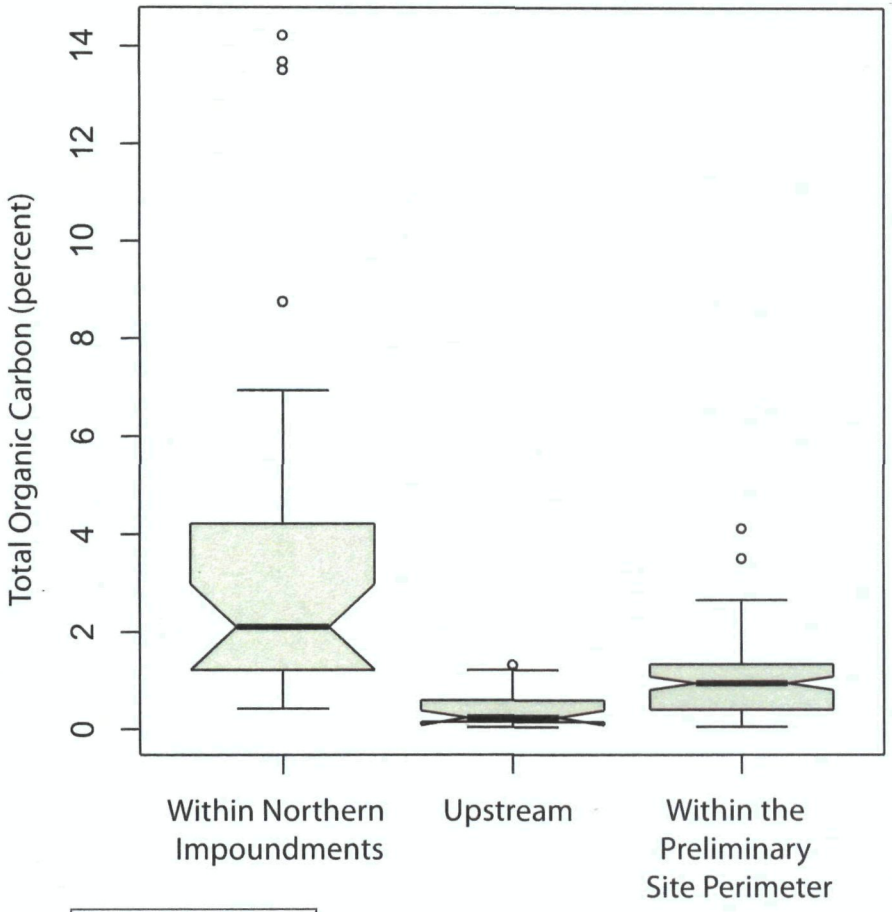

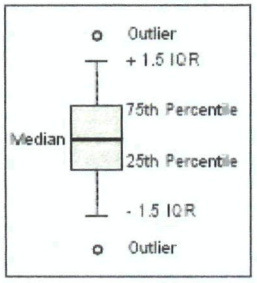

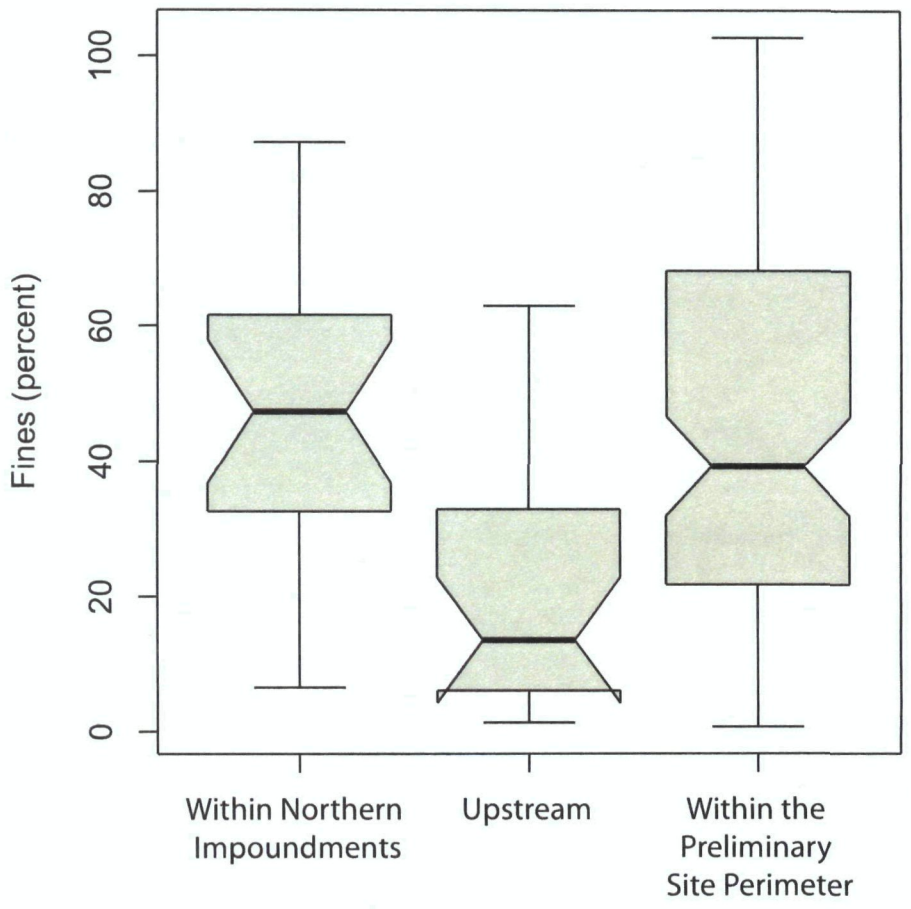

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Figure 7
Comparison of Total Organic Carbon and Fines among Samples Located within the Northern Impoundments, Upstream, and within the Preliminary Site Perimeter
Data Gaps Memorandum
SJRWP Superfund/MIMC and IPC